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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	:	Ernest A. Voisin
Appl. No.	:	09/121,725
Filed	:	July 24, 1998
TC/A.U.	:	1761
Examiner	:	Drew Becker

Docket No. : V98-1054

Examiner Marian Knode
United States Patent and Trademark Office
Technology Center 1700
Post Office Box 1450
Alexandria, VA 22313-1450

SUBMISSION OF DECLARATION UNDER 37 C.F.R. § 1.132

The applicant would like to thank Examiner Knode for the courtesy of the telephone conversation granted to the applicant's representatives on February 17, 2004. Pursuant to the agreement with the Examiner, the applicant submits herewith a copy of his Section 132 Declaration (Exhibit 1) that had been submitted in a related application Serial No. 09/457,835. This declaration was filed to overcome the citation of prior art reference JP 4-356156. The declaration relied on the exhaustive tests performed by the applicant to test efficacy of the method as disclosed in the Japanese reference. The tests showed that the method of the '456 application is unreliable at best, not producing any shucking at either 1000ATM, or 2000ATM at ambient temperature. At 3000ATM it took application of heat to 68 degrees Fahrenheit to get the shells release after 5 minutes. At 4000ATM, the shells released after 3 min. and elevated temperature of 74°Fahrenheit. On May 23, 2001, the inventor and his representatives attempted to discuss the results of these tests and the Declaration with Examiner Becker, who indicated that the Declaration, which considers elevated temperatures, was not relevant to the instant application.

The applicant further submits a copy of JP 2000-157157A, (Exhibit 2) (NOT PRIOR ART REFERENCE), which fully supports the statements made by the inventor in the above-identified declaration. Specifically, please refer to the table on page 16/28 (Exhibit 4) with hand-written notations made by the inventor and corresponding to the translation of the text. JP 157157 supports inventor's tests showing that at 1000 ATM, 5 min. processing and at 50°F (10° C) (ambient temperature), no shells opened, gapped or muscle released. At 2000ATM, 5 min. processing and at 50°F (10° C) (ambient temperature), 22% gapped but muscle stuck to shell, which means no shucking. At 3000ATM, 5 min. processing and at 50°F (10° C) (ambient temperature), 85% gapped and 100% muscle released from shell. It is only at 4000ATM, that the method produced a shell opening and muscle release with a degree of certainty. Of course, as the temperature increased, so did the percentage of the successful shucking.

The applicant further brings attention to the graph on page 27/28 (Exhibit 3) of the translated reference, with hand-written notations made by the applicant. The graph summarizes the findings of the '157 application.

We again respectfully urge that JP '156 should not be used for the purposes of claim rejection of the instant claims under either Section 102 or Section 103, particularly since the enablement of the disclosure of the cited prior art is under question. To allege inherency of the disclosure of the instant invention by the Japanese reference is akin to suggesting the Table of Periodic Elements inherently discloses aspirin. The particular time and pressure criteria claimed in the instant application has been attested not to be rendered inherent by the cited prior art in the declarations of persons having more than ordinary skill in this art.

As we discussed on the phone, please be good enough to analyze the information provided and assist this inventor in securing the claim language that we believe he is rightfully entitled to. Allowance of the instant application would enhance the economic situation currently involved in Mr. Voisin's life personally, as well as in the State of Louisiana.

Respectfully submitted

CERTIFICATE OF MAILING
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cc: Examiner Becker with attachments
Group Director Jacqueline Stone with attachments

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Ernest A. Voisin

Serial No. 09/457,835 Group Art Unit: 3643

Filed: December 9, 1999 Examiner: Willis Little

For: "A Process of Elimination of Bacteria In Shellfish..." Date: October 23, 2000

DECLARATION UNDER 37 C.F.R. SECTION 132

I, Ernest A. Voisin, applicant of the above-identified application, declare and say:

That I am a citizen of the United States and I reside at 203 Tina Street, Houma, LA 70363;

That I am the inventor of the above-identified application;

That I have been in the seafood processing business for over thirty years and am intimately familiar with all aspects of harvesting, farming and processing raw seafood, in particular raw molluscan shellfish;

That I am President of Motivatit Seafoods, Inc., a Louisiana corporation engaged in the business of processing raw seafood;

That I am familiar with Japanese patent application No. 4-356156 cited by the U.S. Patent Office in the Office Action of March 10, 2000;

That I conducted an exhaustive series of tests at the facilities of Motivatit Seafoods, Inc. in Houma, Louisiana following the steps outlined in Japanese application No. 4-356156 and described in detail hereinafter, to verify the teachings of the cited reference and compare them with the method of the instant invention;

That the tests started with oysters (the subject of the Japanese reference) being taken from a cooler where they were kept at 38 degrees Fahrenheit and then allowed to rest to come to the ambient temperature of about 50 degrees Fahrenheit;

That in accordance with the teachings of the cited reference, oysters in shells were placed in a pressure chamber with water;

That the pressure chamber was then pressurized to 1000 ATM at ambient temperature of about 50 degrees Fahrenheit; at that pressure level no shucking of oysters took place;

During the next test, the temperature was elevated to 90 degrees Fahrenheit at 1000 ATM, and it took 15 minutes for the shells to release;

That during the next test, while maintaining pressure at 1000 ATM, the temperature was elevated to 110 degrees Fahrenheit, and it took 10 minutes of pressure application for the shells to release;

That during the next test, the chamber was pressurized to 2000 ATM; however, continued application of pressure at ambient temperature for 3-10 minutes did not release the shells, but when the temperature was elevated to 75 degrees Fahrenheit - the shells released after 10 minutes;

EXHIBIT

1

During the next series of tests, the pressure was maintained at 2000 ATM, while the temperature was increased; it took 5 minutes at 95 degrees to release the shells and 3 minutes at 115 degrees to release the shells;

That the next series of tests were conducted under the test pressure of 3000 ATM; application of 3000 ATM pressure for 0.5 to 5 minutes, as claimed in the Japanese reference, did not result in a complete shucking of all oysters in the batch, only about 80 percent were shucked, which makes the method of JP 4-356156 commercialy uncertain;

However, when the temperature was elevated to 68 degrees Fahrenheit (at 3000 ATM), the shells released after 5 minutes; when the temperature was elevated to 95 degrees Fahrenheit the shells released in 3 minutes, and when the temperature was raised to 120 degrees F. - it took only 1 minute to release the shells;

The last series of tests were conducted using 4000 ATM; the results showed that pressurization alone for 0.5 - 5 minutes does not completely shuck all the oysters in the batch; at 3 minutes the heat of 74 degrees was needed, at 1 minute - 102 degrees Fahrenheit to release the oyster shells;

That the results of the tests are summarized in the attached graph;

That the above tests clearly demonstrate superiority of the method of the instant application and criticality of adding the temperature factor to the shellfish shucking process, as claimed in the above-identified application;

That in my opinion the aforementioned superiority with respect to achieving a uniform result critical to commercial seafood processing of the claimed invention is unobvious to one of ordinary skilled in the art;

That the undersigned declares further that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patents issuing thereon;

Further declarant saith not.

Date: 10-23-00

Ernest A. Voisin

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L7: Entry 1 of 110 File: JPAB Jun 13, 2000

PUB-NO: JP02000157157A
DOCUMENT-IDENTIFIER: JP 2000157157 A
TITLE: METHOD OF OPENING BIVALVE

PUBN-DATE: June 13, 2000

INVENTOR-INFORMATION:

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MARINO FORUM 21	N/A

APPL-NO: JP10340234
APPL-DATE: November 30, 1998

INT-CL (IPC): A22C 29/04

ABSTRACT:

PROBLEM TO BE SOLVED: To provide a method of opening bivalves of high practicability without damage to the texture and taste of shucked shell meat in no need of manual operation relating to opening living bivalves having shells.

SOLUTION: Raw shell oysters are opened by treating them with both heat and pressure. In this case, the heat and the pressure are ranged within no occurrence of irreversible change in the shell meat protein, and the pressure required to the pressure vessel is reduced lower as far as possible. In an embodiment, the pressure is set to 800 kgf/cm2, when the heating temperature is set to 30°C

EXHIBIT 2

MACHINE-ASSISTED TRANSLATION (MAT):

(19)【発行国】 日本国特許庁（ＪＰ）	**(19)[ISSUING COUNTRY]** Japanese Patent Office (JP)
(12)【公報種別】 公開特許公報（Ａ）	Laid-open (kokai) patent application number (A)
(11)【公開番号】 特開２０００－１５７１５７（Ｐ２０００－１５７１５７Ａ）	**(11)[UNEXAMINED PATENT NUMBER]** Unexamined Japanese Patent 2000-157157 (P2000-157157A)
(43)【公開日】 平成１２年６月１３日（２０００．６．１３）	**(43)[DATE OF FIRST PUBLICATION]** June 13th, Heisei 12 (2000.6.13)
(54)【発明の名称】 二枚貝の開殻方法	**(54)[TITLE]** Method of opening bivalves
(51)【国際特許分類第７版】 A22C 29/04	**(51)[IPC]** A22C 29/04
【ＦＩ】 A22C 29/04	**[FI]** A22C 29/04
【審査請求】 未請求	**[EXAMINATION REQUEST]** UNREQUESTED
【請求項の数】　2	**[NUMBER OF CLAIMS]** Two
【出願形態】　ＯＬ	**[Application form]** OL
【全頁数】　7	**[NUMBER OF PAGES]** Seven
(21)【出願番号】 特願平１０－３４０２３４	**(21)[APPLICATION NUMBER]** Japanese Patent Application No. 10-340234
(22)【出願日】 平成１０年１１月３０日（１９９８．１１．３０）	**(22)[DATE OF FILING]** November 30th, Heisei 10 (1998.11.30)

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【テーマコード（参考）】
4B011

【Ｆターム（参考）】
4B011 MC02

[Theme code (reference)]
4B011

[F term (reference)]
4B011 MC02

(57)【要約】

(57)[SUMMARY]

【課題】
殻付の生の二枚貝の開殻に関し、作業者による手作業を不要にしながらも、剥き身の食感や風味を損うことなく、しかも実用性の高い開殻方法を得る。

【解決手段】
殻付の生の牡蠣に対し熱及び圧力の両方を作用させることで開殻させる。その際、この熱及び圧力としては、特に、貝の身のタンパク質に不可逆的な変性を生じさせない範囲とし、且つできるだけ圧力を低く抑えることで圧力容器に求められる耐圧性を低く抑える。具体的には、加熱温度が３０℃の場合には加圧圧力を８００kgf/cm^{2}に設定す

[SUBJECT]
It relates to the open shell of raw bivalves having shells.

Moreover, the high method of opening of the practicability is obtained, without impairing the food feeling and the taste of the shucked shell meat, though the manual work by the operator is made unnecessary.

[SOLUTION]
An open shell is carried out by making both heat and pressure act to raw oysters having shells.

It makes as the range which does not produce the shell meat protein in particular the irreversible denaturation, as this heat and a pressure in that case.

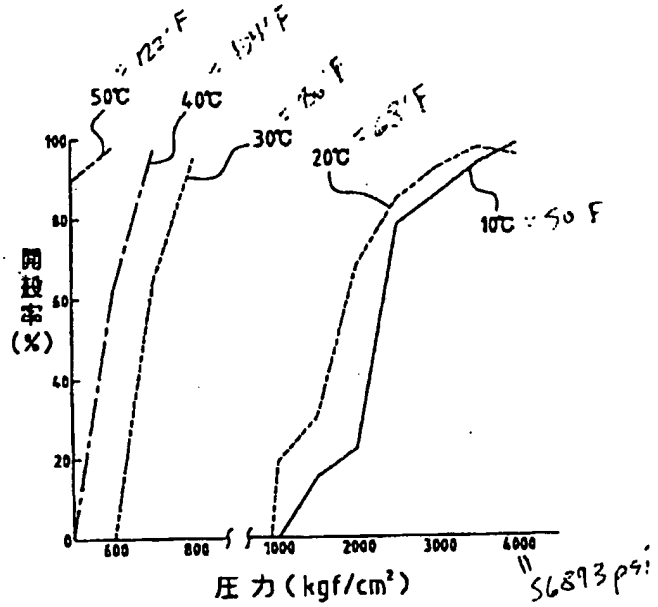
And the pressure resistance for which a pressure vessel is required by restraining a pressure low as much as possible is restrained low.

Specifically, when heating temperature is 30 degree C, a pressed pressure is set as 800 kgf/cm2s.

る。加熱温度が４０℃の場合には加圧圧力を７００kgf/cm² に設定する。加熱温度が４５℃の場合には加圧圧力を６５０kgf/cm² 程度に設定する。

When heating temperature is 40 degree C, a pressed pressure is set as 700 kgf/cm2s.

When heating temperature is 45 degree C, a pressed pressure is set as about 650 kgf/cm2s.



【特許請求の範囲】

[CLAIMS]

【請求項１】
殻付の生の二枚貝を、貝の身のタンパク質に生じる熱変性が可逆的なものである温度以下の温度まで加熱すると共に、
この温度において貝の閉殻筋と外殻との接合部分が外れる圧力を二枚貝に作用させることを特徴とする二枚貝の開殻方法。

[CLAIM 1]
The pressure which the junctional part of the closed shell muscle of shellfish and an outer covering detaches in this temperature that heats raw bivalves having shells to the temperature below the temperature whose thermal denaturation produced in the shell meat protein is reversible is made act on a bivalve.

Method of opening bivalves characterized by the above-mentioned.

【請求項２】
請求項１記載の二枚貝の開殻方法において、
二枚貝を密閉容器内に入れ、この密閉容器内を３０℃以上で５０℃未満の温度まで加熱し、且

[CLAIM 2]
In the method of opening bivalves of Claim 1, a bivalve is put in a sealing container and the inside of this sealing container is heated to the temperature of less than 50 degree C above 30 degree C.

And the pressure in a sealing container is set

つ密閉容器内の圧力を１０００ kgf/cm² 未満に設定することを特徴とする二枚貝の開殻方法。

as less than 1000 kgf/cm2s.
Method of opening bivalves characterized by the above-mentioned.

【発明の詳細な説明】

[DETAILED DESCRIPTION OF INVENTION]

【０００１】

[0001]

【発明の属する技術分野】
本発明は、殻付の生の二枚貝（牡蠣等）を開ける（以下、これを開殻という）方法に係る。特に、本発明は、作業者による手作業を不要にした開殻方法の改良に関するものである。

[TECHNICAL FIELD]
This invention realates to the method of opening raw bivalves having shells (oyster etc.) (this being hereafter said open shell).
In particular this invention relates to improvement of the method of opening which made the manual work by the operator unnecessary.

【０００２】

[0002]

【従来の技術】
牡蠣等の食用の二枚貝から貝の身（剥き身）を取り出す作業として、従来は、作業者が鉤型の刃物等を使用して行っていた。例えば牡蠣の身を取り出す作業は、刃物により貝の外殻外縁の一部を傷付け、そこから貝の中に刃物を差し入れて開殻する。その開殻後、この刃物により外殻から身を取り出す（以下、これを脱殻という）ようにしている。

[PRIOR ART]
As operation which takes out shell meat (shucked shell meat) from bivalves for food use, such as an oyster, conventionally, the operator was performing using the hook type cutter etc.
For example, operation which takes out the body of an oyster damages with a cutter a part of outer covering outer edge of shellfish. The open shell of the cutter is inserted and carried out into shellfish from that.
After carrying out an open shell, the body is taken out from an outer covering with this cutter (this is hereafter said taking the meat out of the shell).

【０００３】
ところが、この作業は熟練を要するため、未熟な作業者の作業では、単位時間当たりの剥き身の取り出し数が少なく効率が悪いばかりでなく、剥き身に外殻の破片が混入したり、刃物によって剥き身を傷付けたりして商

[0003]
However, this operation requires skill. Therefore, in an operator's unripe operation, the number of extraction of the shucked shell meat per unit duration is few, and an efficiency is bad. Also the split of an outer covering mixes in the shucked shell meat.
Moreover, the shucked shell meat will be damaged and a commercial value will be made

品価値を低下させてしまう。また、近年、作業者の高齢化に伴い作業者が不足して生産量の減少を招いている。更には、人手により１個づつ取り出し作業を行うため、たとえ熟練者であっても単位時間当たりに取り出せる剥き身の数には限界がある。

to reduce with a cutter.

Moreover, in connection with an operator's aging, an operator does an insufficiency and has caused the reduction of the throughput in recent years.

Furthermore, in order for a human hand to perform extraction operation individually, even if it is an expert, there is a threshold in the number of the shucked shell meat which can be taken out to per unit duration.

【０００４】
この点に鑑み、上記の手作業を不要にして二枚貝の開殻を可能にするものとして、特開平４－３５６１５６号公報に開示されている加工貝の製造方法がある。この製造方法は、殻付の生の貝に、常温の下で数千 kgf/cm^2 の高圧を作用させるものである。これにより、容易に開殻できる加工貝を製造することができる。

[0004]
In view of this point, as that which make an above-mentioned manual work unnecessary and make the open shell of a bivalve possible, there is a manufacturing method of the processing shellfish currently indicated by the Unexamined Japanese Patent 4- 356156.

This manufacturing method makes the high pressure of several thousand kgf/cm2 act on the raw shell having shells at a normal temperature.

The processing shellfish whose open shell can be carried out easily by this can be manufactured.

【０００５】
この公報に開示される開殻のメカニズムは以下のとおりであると推測する。本来、二枚貝の各外殻を繋いでいる蝶番部分は外殻を開こうとしている。これに対し、各外殻の内面同士を連結している閉殻筋（一般に貝柱と呼ばれている）が収縮し蝶番の力にうち勝った力で外殻同士を引き寄せている。つまり、この閉殻筋と外殻との接合部分を何らかの方法で外せば貝は開殻するのである。上記公報では、貝を高圧の環境下におくことで、固体部分である外殻と軟体部分である閉殻筋との収縮状態に位相差を生じさせ、これにより、閉殻筋と外殻との接合部分を外

[0005]
It is assumed that the mechanisms of the open shell indicated by this gazette are as follows.

Originally, the hinge part which has connected each outer covering of a bivalve tends to open an outer covering.

On the other hand, outer coverings are drawn near by the strength which the closed shell muscle (generally called the adductor_muscle) which has connected the inner faces of each outer covering shrunk, and overcame the strength of a hinge.

In other words, if the junctional part of this closed shell muscle and outer covering is removed by a certain method, the open shell of the shellfish is carried out.

A phase difference is made to be generated by what shellfish is set by the high-pressure environment in the above gazette in shrinkage state of the outer covering which is the solid part, and the closed shell muscle which is a part

している。また、貝に作用する高圧により閉殻筋のタンパク質が変性し、これも閉殻筋と外殻との接合部分を外すことに寄与している。

for a soft body part.

Thereby, the junctional part of a closed shell muscle and an outer covering is removed.

Moreover, protein of a closed shell muscle denatures by the high pressure which acts on shellfish. It has contributed to this removing the junctional part of a closed shell muscle and an outer covering.

【０００６】

[0006]

【発明が解決しようとする課題】

ところが、上記公報の方法を実現するためには、貝を数千kgf/cm^{2}といった非常に高い圧力の環境下におく必要があることから高い耐圧性を有する圧力容器が必要である。このため、１回の加圧動作で大量の貝を加工しようとする際には、大型でしかも高い耐圧性を有する圧力容器が必要になる。つまり、容器の材質として強度の高いものを選択し、且つ容器の壁厚寸法を大きく設定しておく必要がある。その結果、圧力容器の製造コストが高くなってしまい実用性に欠ける。

[PROBLEM ADDRESSED]

However, in order to materialize the method of the above gazette, the pressure vessel which has a high pressure resistance from shellfish being set by the environment of a very high pressure said several thousand kgf/cm2 is necessary.

For this reason, the large-sized pressure vessel which comes out and moreover has a high pressure resistance is needed in the case it processing a lot of shellfishes in one pressure application operation.

In other words, a strong highness needs to be selected as a material of a container, and the wall thickness dimension of a container needs to be set up greatly.

As a result, the manufacturing cost of a pressure vessel becomes high, and the practicability is missing.

【０００７】

また、非常に高い圧力の環境下に貝を晒すため、貝の身のタンパク質が圧力の影響を受けて変性し、剥き身の食感や風味が損なわれてしまう可能性がある。この圧力の悪影響は上記公報にも開示されていることである。

[0007]

Moreover, in order to expose shellfish to the environment of a very high pressure, the shell meat protein denatures in response to the influence of a pressure.

The food feeling and the taste of the shucked shell meat may be impaired.

The bad influence of this pressure is indicated by the above gazette.

【０００８】

また、二枚貝を高温度に加熱すれば開殻することは一般に知ら

[0008]

Moreover, if a bivalve is heated to a high temperature, carrying out an open shell is known generally.

れている。しかし、大気圧中で開殻させるには例えば６０℃程度まで加熱する必要がある。これでは、貝の身のタンパク質に不可逆的な熱変性が生じてしまう（このタンパク質の熱変性に関しては、「理化学大辞典」白井俊明他編　岩崎学術出版社（1967 年）の５８１頁に開示されている。この文献では、タンパク質は６０℃に熱すると凝固するという記載がある）。この熱変性のメカニズムは、タンパク質を高温度に加熱すると、タンパク質分子間の側鎖の熱運動が起こり、存在している分子間の結合が切れて、この分子間に新たな結合状態が生じるといったものである。このような熱変性が生じた場合、剥き身の食感や風味が大きく損なわれてしまう。つまり、剥き身が煮えた状態になってしまう。このため、貝を高温度に加熱するのみで開殻させるといった手法は、生食用の剥き身を生産するものとしては到底使用できない。

However, it needs to heat, for example, to about 60 degree C to carry out an open shell in atmospheric pressure.

This, an irreversible thermal denaturation is generated in the shell meat protein (indicated by 581 pages of the editing Iwasaki scientific publishing company (1967) besides "physics and chemistry great dictionary" Shirai Toshiaki about the thermal denaturation of this protein).

By this literature, protein has heat, then description of coagulating in 60 degree C.

When the mechanism of this thermal denaturation heats protein to a high temperature, the thermal motion of a protein intermolecular side chain will occur. A intermolecular bond which is present cuts.

It is said that new bond state will be generated between molecules.

When such a thermal denaturation is generated, the food feeling and the taste of the shucked shell meat will be impaired greatly.

In other words, the shucked shell meat will be boiled.

For this reason, how to carry out the open shell of the shellfish only by heating to a high temperature cannot be used by any possibility as that which produces the shucked shell meat of fresh market.

【０００９】
本発明は、かかる点に鑑みてなされたものであり、その目的とするところは、殻付の生の二枚貝の開殻に関し、作業者による手作業を不要にしながらも、剥き身の食感や風味を損うことなく、しかも実用性の高い開殻方法を得ることにある。

[0009]
This invention is made in view of such a point.

The pla~~ce made into the object is related~~ with the open shell of raw bivalves having shells.

It is in moreover obtaining the high method of opening of the practicability, without impairing the food feeling and the taste of the shucked shell meat, though the manual work by the operator is made unnecessary.

【００１０】

[0010]

【課題を解決するための手段】

[SOLUTION OF THE INVENTION]

－発明の概要－
上記目的を達成するために、本発明は、殻付の生の二枚貝に対し熱及び圧力の両方を作用させることで開殻させるようにしている。その際、この熱及び圧力としては、特に、貝の身のタンパク質に不可逆的な変性を生じさせない範囲とし、且つできるだけ圧力を低く抑えることで圧力容器に求められる耐圧性を低く設定できるようにしている。

- Summary of Invention -
In order to attain the above object, it is made to carry out the open shell of this invention by making both heat and pressure act to raw bivalves having shells.
In particular as this heat and a pressure, it makes as the range which does not produce the shell meat protein the irreversible denaturation, in that case.
And it enables it to set up low the pressure resistance for which a pressure vessel is required by restraining a pressure low as much as possible.

【００１１】
－解決手段－
具体的に、本発明が講じた第１の解決手段は、殻付の生の二枚貝を、貝の身のタンパク質に生じる熱変性が可逆的なものである温度以下の温度まで加熱する。また、この温度において貝の閉殻筋と外殻との接合部分が外れる圧力を二枚貝に作用させるようにしている。

[0011]
- Solution Means -
The thermal denaturation which produces raw bivalves having shells in the shell meat protein specifically heats first solution means which this invention provided, to the temperature below reversible temperature.
Moreover, it is made to make act on a bivalve the pressure which the junctional part of the closed shell muscle of shellfish and an outer covering detaches in this temperature.

【００１２】
この特定事項により、貝はタンパク質が不可逆的な熱変性を生じない範囲で加熱される。このように、貝が加熱されていることにより、貝に作用させる圧力が比較的低くても貝の閉殻筋と外殻との接合部分が容易に外れて開殻する。

[0012]
According to this specific matter, shellfish is heated in the range from which protein does not produce an irreversible thermal denaturation.
Thus, even when the pressure made act on shellfish is comparatively low, by heating the shellfish, the junctional part of the closed shell muscle of shellfish and an outer covering separates easily, and carries out an open shell.

【００１３】
この温度域及び圧力域を具体化したものが第２の解決手段である。つまり、この解決手段は、上記第１の解決手段において、二枚貝を密閉容器内に入れ、この密閉容器内を３０℃以上で５

[0013]
That which materialized this temperature range and the pressure region is 2nd solution means.
In other words, this solution means puts a bivalve in a sealing container in first solution means.
The inside of this sealing container is heated to the temperature of 30 degree C - 50 degree C.

０℃未満の温度まで加熱し、且つ密閉容器内の圧力を１０００kgf/cm² 未満に設定することで開殻させるものである。

【００１４】
一般に、タンパク質は４０℃を超えると緩やかな熱変性を開始する（このことは、「生物事典」江原有信、市村俊英編　旺文社（1991 年）の２３１頁に開示されている）。この熱変性は５０℃程度までは可逆的なものである。つまり、この状態から温度を下げると、タンパク質は略元の状態に戻る。従って、貝の身は本来の食感や風味を保つことになる。この温度域に貝を加熱し、この貝に圧力を作用させることで開殻させるのである。この圧力としては、圧力によるタンパク質の変性が生じず、また、圧力容器に要求される耐圧性も比較的低くできる１０００kgf/cm² 未満に設定される。言い換えると、上記の温度域に貝を加熱した場合、この貝に作用させる圧力が１０００kgf/cm² 未満であっても閉殻筋と外殻との接合部分を外すことができ、開殻が可能となるのである。

【００１５】
本発明の発明者らは、二枚貝の開殻に関し、貝に作用させる温度及び圧力について種々の実験を重ねた。そして、貝の身のタンパク質に熱変性が生じない温度域またはこのタンパク質の熱変性が可逆的なものである温度域である３０℃以上で５０℃未満の温度域に貝を加熱した状態

And the open shell of the pressure in a sealing container is carried out by setting as less than 1000 kgf/cm2s.

[0014]
Generally, when protein exceeds 40 degree C, a loose thermal denaturation will be started (this is indicated by 231 pages of "organism encyclopedia" Arinobu Ebara Toshihide Ichimura Obunsha company (1991).
About 50 degree C of this thermal denaturation is reversible.
In other words, when lowering temperature from this state, protein will return to an original state approximately.
Therefore, shell meat will maintain an inherent food feeling and flavour.
Shellfish is heated to this temperature range.
An open shell is carried out by making a pressure act on this shellfish.
Denaturation of protein by the pressure is not generated as this pressure. Moreover, it is set as less than 1000 kgf/cm2s which can also make comparatively low the pressure resistance required of a pressure vessel.
When in other words shellfish is heated to the above-mentioned temperature range, even if the pressure made act on this shellfish is less than 1000 kgf/cm2s, the junctional part of a closed shell muscle and an outer covering can be removed.
The open shell is made.

[0015]
The inventors of this invention accumulated experiment various about the temperature and the pressure which are made act on shellfish about the open shell of a bivalve.
And, where shellfish is heated to the temperature range of 30 degree C - 50 degree C which is the temperature range which a thermal denaturation does not produce in the shell meat protein, or the temperature range whose thermal denaturation of this protein is

では、この貝に作用させる圧力が１０００kgf/cm² 未満であっても十分に開殻させることができることを確認し、本発明に至ったのである。

reversible, even when the pressure made act on this shellfish is less than 1000 kgf/cm2s, it confirms that an open shell can be carried out sufficiently.

It resulted in this invention.

【００１６】

[0016]

【発明の実施の形態】

以下、本発明の実施の形態を図面に基づいて説明する。本実施形態では、二枚貝として牡蠣、帆立貝、浅蜊を対象とし、これら貝を開殻させる場合を例に掲げる。

[Embodiment]

Hereafter, the embodiment of this invention is explained based on a drawing.

In this embodiment, an oyster, a scallop, and a short-neck clam are made objective as a bivalve.

The case where the open shell of these shellfish are carried out is hung up over an example.

【００１７】

本形態では、牡蠣、帆立貝、浅蜊を開殻させるための温度条件及び圧力条件について以下に述べる実験装置を使用して実験を行った。

[0017]

With this form, it experimented about the temperature conditions and the flow and pressure requirement for carrying out the open shell of an oyster, a scallop, and the short-neck clam using test equipment described below.

【００１８】

－実験装置の説明－

図１は実験装置１の模式図である。この実験装置１は、耐圧容器２を備えている。この耐圧容器２は、例えば外径が４５０mm の円筒状の密閉容器であって、壁厚寸法は１００mm に設定されている。この耐圧容器２内には清水または海水が貯留されている。この耐圧容器２内にはヒータ３が配置されている。このヒータ３は、耐圧容器２内の水温を５０℃まで上昇させることができると共に、図示しない操作パネルの操作により、この水温を任意の温度に調整する

[0018]

- Description of Test Equipment -

Figure 1 is a model figure of test equipment 1.

This test equipment 1 has the pressure container 2.

This pressure container 2 is a sealing container of the cylindrical shape whose outer diameter is 450 mm, for example, comprised such that the wall thickness dimension is set as 100 mm.

Spring water or seawater is stored in this pressure container 2.

The heater 3 is arranged in this pressure container 2.

This heater 3 can adjust this water temperature to arbitrary temperature by operation of a not shown console panel, while the water temperature in a pressure container 2 can be risen to 50 degree C.

ことができるようになっている。

【００１９】
また、耐圧容器２には加圧ポンプ４が接続されている。上記操作パネルを操作することで、この加圧ポンプ４により耐圧容器２内を５００kgf/cm² ～４０００kgf/cm² の範囲で任意の圧力に調整することができるようになっている。更に、この耐圧容器２には温度センサ５及び圧力センサ６が取り付けられている。温度センサ５は耐圧容器２内の温度を検出して表示する。圧力センサ６は耐圧容器２内の圧力を検出して表示する。

[0019]
Moreover, the booster pump 4 is connected to the pressure container 2.

By operating an above console panel, the inside of a pressure container 2 can be adjusted now to arbitrary pressures in the range of 500 kgf/cm2s - 4000 kgf/cm2 by this booster pump 4.

Furthermore, the temperature sensor 5 and the pressure sensor 6 are attached in this pressure container 2.

The temperature sensor 5 detects and displays temperature in a pressure container 2.

The pressure sensor 6 detects and displays the pressure in a pressure container 2.

【００２０】
－実験動作の説明－
次に、上述した実験装置１を使用した実験動作について説明する。本形態では第１～第４の実験を行っている。

[0020]
- Description of Experiment Operation -

Next, an experiment operation which used test equipment 1 mentioned the above is explained.

The 1st - 4th experiment are performed with this form.

【００２１】
第１の実験は、二枚貝として牡蠣を対象とし、耐圧容器２内の温度条件及び圧力条件に応じた牡蠣の開殻率及び脱殻率を計測したものである。具体的には、耐圧容器２内に１００個の牡蠣を置き、耐圧容器２内の水温を１０℃、２０℃、３０℃、４０℃、５０℃とした場合のそれぞれに対し、耐圧容器１内の圧力を５００、６００、７００、７５０、８００、９００、１０００、１５００、２０００、２５００、３０００、３５００、４０００kgf/cm² とした際の牡蠣の開殻

[0021]
First experiment make an oyster objective as a bivalve.

The rate of the open shell and the rate of the taking the meat out of of an oyster were measured depending on the temperature conditions and the flow and pressure requirement in a pressure container 2.

Specifically, 100 oysters are put into a pressure container 2. It performed by measuring the rate of the open shell and the rate of the taking the meat out of of an oyster at the time of making the pressure in a pressure container 1 into 500, 600, 700, 750, 800, 900, 1000, 1500, 2000, 2500, 3000, 3500, and 4000 kgf/cm2 respectivelywhen the water temperature in a pressure container 2 is made into 10 degree C, 20 degree C, 30 degree C, 40

50°F 68°F 86°F 104°F

率及び脱殻率を計測することにより行った。

【００２２】
第２の実験も二枚貝として牡蠣を対象とし、耐圧容器２内の温度条件及び圧力条件だけでなく、その温度及び圧力の環境下に牡蠣を置いておく作用時間をも考慮したものである。具体的には、耐圧容器２内の温度を４０℃付近で変化させた場合のそれぞれに対し、耐圧容器２内の圧力を大気圧から１０００ kgf/cm² の間で変化させ、且つ作用時間を変化させた際の牡蠣の開殻状態及び脱殻状態を、実験条件１～実験条件１０まで各条件を変更して検査することにより行った。

【００２３】
第３の実験は、二枚貝として帆立貝を対象とし、耐圧容器２内の温度条件及び圧力条件に応じた帆立貝の開殻率を計測したものである。具体的には、耐圧容器２内に１０個の帆立貝を置き、耐圧容器２内の水温を３０℃、４３℃、４５℃とした場合のそれぞれに対し、耐圧容器１内の圧力を５００、６００、７００、９００、１０００ kgf/cm² とした際の帆立貝の開殻率を計測することにより行った。

【００２４】
第４の実験は、二枚貝として浅蜊を対象とし、耐圧容器２内の温度条件及び圧力条件に応じた浅蜊の開殻率を計測したもので

degree C, and 50 degree C
(122° F)

[0022]
2nd experiment also make an oyster objective as a bivalve.

Not only the temperature conditions and the flow and pressure requirement in a pressure container 2 but the effect duration which puts the oyster on the environment of the temperature and a pressure was considered.

Specifically the pressure in a pressure container 2 is changed from atmospheric pressure among 1000 kgf/cm2s respectivelywhen changing temperature in a pressure container 2 near 40 degree C.

And it performed by altering each conditions and inspecting the open shell state and the taking the meat out of the shell state of an oyster at the time of changing the effect duration to the experiment condition 1-experiment conditions 10.

[0023]
Third experiment make a scallop objective as a bivalve.

The rate of an open shell of a scallop is measured depending on the temperature conditions and the flow and pressure requirement in a pressure container 2.

Specifically, it performed by measuring the rate of an open shell of the scallop at the time of making the pressure in a pressure container 1 into 500, 600, 700, 900, and 1000 kgf/cm2 respectively when ten scallops were put into the pressure container 2 and the water temperature in a pressure container 2 is made into 30 degree C, 43 degree C, and 45 degree C.

[0024]
4th experiment make a short-neck clam objective as a bivalve.

The rate of an open shell of a short-neck clam was measured depending on the temperature conditions and the flow and pressure

ある。実験条件としては、上記第３の実験の場合と同様である。

【００２５】
これら実験の作業手順としては、先ず、複数個の生の二枚貝を洗浄した後、これら二枚貝を耐圧容器２内に投入する。この状態で、ヒータ３により耐圧容器２内を所定温度（実験条件温度）まで加熱する。その後、加圧ポンプ４を駆動して耐圧容器２内の圧力を所定圧力（実験条件圧力）まで上昇させる。この加熱及び加圧した状態を所定時間だけ保持する。第１、第３及び第４の実験では、この時間を一定（例えば５分間）に設定する。第２の実験では、この時間を実験条件に応じて変更する。その後、耐圧容器２を開放し、第１及び第２の実験では開殻している牡蠣の個数及び脱殻している牡蠣の個数を検査する。更に、第２の実験では、その脱殻の状態を検査する。一方、第３及び第４の実験では開殻している二枚貝の個数を検査する。このような実験作業を実験条件を変更しながら複数回行う。

【００２６】
尚、本発明に係る開殻方法を実際に使用して開殻及び脱殻し剥き身を出荷する作業としては、収穫した貝を洗浄し、これら貝を耐圧容器内に入れて予備加熱を行う。その後、耐圧容器内を

requirement in a pressure container 2.

As experiment conditions, it is the same as that of the case of above third experiment.

[0025]

As a sequence of operation of these experiment, the multiple raw bivalve was washed first. After that, these bivalve are supplied in a pressure container 2.

In this state, the inside of a pressure container 2 is heated to predetermined temperature (experiment condition temperature) at a heater 3.

After that, a booster pump 4 and the pressure in a pressure container 2 is risen to a predetermined pressure (experiment condition pressure).

This state where it heated and pressed is kept for a predetermined duration.

In the 1st, the 3rd, and 4th experiment, this duration is set as regularity (for example, for 5 minutes).

In 2nd experiment, this duration is altered depending on experiment conditions.

After that, a pressure container 2 is opened wide.

In first and second experiment, the number of the oyster which is carrying out the open shell, and the number of an oyster which is carrying out taking the meat out of the shell are inspected.

Furthermore, the state of the taking the meat out of the shell is inspected in 2nd experiment.

On the other hand, in the 3rd and 4th experiment, the number of the bivalve which is carrying out the open shell is inspected.

Such an experimentation is performed two or more times, altering experiment conditions.

[0026]

In addition, as an open shell (actually using the method of opening based on this invention) and operation which carries out taking the meat out of the shell and transports the shucked shell meat, the shellfish which gathered a harvest is washed, these shellfish are put in a pressure container, and a preheating is performed.

所定温度まで加熱すると同時に所定圧力まで加圧する。この状態を所定時間維持した後、耐圧容器から貝を取り出して剥き身を回収し、この剥き身を洗浄する。しかる後、これら剥き身を箱詰めし、冷蔵庫（または冷蔵車）で冷蔵しながら出荷するのである。つまり、上記実験作業は、本発明に係る開殻方法を実際に使用する場合と略同様の手順により行われる。

After that, it presses to a predetermined pressure at the same time it heats the inside of a pressure container to predetermined temperature.
After maintaining this state for a predetermined duration, shellfish is taken out from a pressure container and the shucked shell meat is collected.
This shucked shell meat is washed.
After an appropriate time, these shucked shell meat is packed in a box.
It transports, refrigerating in a refrigerator (or refrigerating car).
In other words, an above experimentation is performed by the -like procedure nearly identical with the case where the method of opening based on this invention is actually used.

【００２７】
（第１実験の結果）第１実験の結果を以下の表１に示す。

[0027]
(Result of the 1st experiment) The result of the 1st experiment is shown in the following Table 1.

【００２８】

[0028]

【表１】

[Table 1]

	水温10℃			水温20℃			水温30℃			水温40℃			水温50℃		
圧力 (kgf/cm²)	開殻率 (%)	開殻のみ (%)	脱殻 (%)	開殻率 (%)	開殻のみ (%)	脱殻 (%)	開殻率 (%)	開殻のみ (%)	脱殻 (%)	開殻率 (%)	開殻のみ (%)	脱殻 (%)	開殻率 (%)	開殻のみ (%)	脱殻 (%)
500	—			—			—			0	0	0	86	5	95
600	—			—			0	0	0	82	14	86	97	1	99
700	—			—			66	91	9	97	—	100	—		
750	—			—			80	5	95	—			—		
800	—			—			95	—	100	—			—		
900	—			0	0	0	—			—			—		
1000	0	0	0	19	100	—	—			—			—		
1500	15	100	—	30	87	13	—			—			—		
2000	22	91	9	68	12	88	—			—			—		
2500	78	10	90	84	8	92	—			—			—		
3000	85	—	100	92	—	100	—			—			—		
3500	93	—	100	97	—	100	—			—			—		
4000	98	—	100	95	—	100	—			—			—		

【００２９】
この表１における「開殻率」は、１００個の牡蠣のうち開殻したもの（脱殻まで至ったものを含む）の個数を示している。また、「開殻のみ」は、上記開殻した牡蠣のうち脱殻まで至らず開殻のみに止まったものの割合を示している。「脱殻」は、上記開殻した牡蠣のうち脱殻まで至ったものの割合を示している。また、「水温」、「圧力」、「開殻率」の関係をグラフ化したのが図２である。

[0029]
The "rate of open shell" in this Table 1 shows the number of that (that which resulted to taking the meat out of the shell is included) which carried out the inside open shell as for 100 oysters.

Moreover, although only the "open shell" did not result to taking the meat out of the shell among the oysters which carried out the above open shell but stopped only at the open shell, it shows the ratio.

Although "taking the meat out of the shell" resulted to taking the meat out of the shell among the oysters which carried out the above open shell, it shows the ratio.

Moreover, Figure 2 graph-ized the relationship of "water temperature", a "pressure", and "the rate of an open shell".

【００３０】
この表１及び図２に示すように、水温が１０℃の場合には耐圧容器２内の圧力が１５００ kgf/cm² 程度まで上昇しなければ開殻が開始せず、この温度で

[0030]
If the pressure in a pressure container 2 does not rise to about 1500 kgf/cm2s when water temperature is 10 degree C as shown in this Table 1 and Figure 2, an open shell does not begin. In order to obtain the rate of an open

９０％以上の開殻率を得るためには３５００kgf/cm^{2}程度の非常に高い圧力を作用させねばならなかった。また、水温が２０℃の場合には耐圧容器２内の圧力が１０００kgf/cm^{2}程度まで上昇しなければ開殻が開始せず、この温度で９０％以上の開殻率を得るためには３０００kgf/cm^{2}程度の非常に高い圧力を作用させねばならなかった。つまり、これら温度域では、従来と同様の非常に高い圧力を作用させねば開殻できないことが判る。

shell of 90 % or more at this temperature, the very high pressure of about 3500 kgf/cm2s had to be made act.

Moreover, if the pressure in a pressure container 2 does not rise to about 1000 kgf/cm2s when water temperature is 20 degree C, an open shell does not begin. In order to obtain the rate of an open shell of 90 % or more at this temperature, the very high pressure of about 3000 kgf/cm2s had to be made act.

In other words, in these temperature range, if the similar very high pressure as conventionally is not made act, it turns out that an open shell cannot be carried out.

【００３１】
これに対し、水温が３０℃の場合には耐圧容器２内の圧力が７００kgf/cm^{2}程度であっても開殻が開始し、また、水温が４０℃の場合には耐圧容器２内の圧力が６００kgf/cm^{2}程度であっても開殻が開始し、更に、水温が５０℃の場合には耐圧容器２内の圧力が５００kgf/cm^{2}以下であっても開殻が開始した。

[0031]
On the other hand, when water temperature is 30 degree C, even when the pressure in a pressure container 2 is about 700 kgf/cm2s, an open shell begins. Moreover, when water temperature is 40 degree C, even when the pressure in a pressure container 2 is about 600 kgf/cm2s, an open shell begins.

Furthermore, when water temperature was 50 degree C, even when the pressure in a pressure container 2 was 500 or less kgf/cm2s, the open shell began.

【００３２】
この実験結果により、水温が２０℃以下の場合には全く開殻しなかった圧力域であっても、水温を３０℃以上に設定することで開殻率が急激に上昇することが判る。言い換えると、水温を３０℃以上に設定すれば、牡蠣に作用させる圧力の開殻に寄与する影響力（閉殻筋と外殻との接合部分を外すのに寄与する影響力）が著しく向上することが判る。

[0032]
This experimental result shows that the rate of an open shell rises abruptly by setting water temperature as 30 degree C or more, even when it is the pressure region which did not carry out the open shell at all, when water temperature is 20 degree C or less.

If in other words water temperature is set as 30 degree C or more, it turns out that the influence (influence which contributes to removing the junctional part of a closed shell muscle and an outer covering) which contributes to the open shell of the pressure made act on an oyster improves remarkably.

【００３３】
特に、水温が３０℃の場合には耐圧容器２内の圧力が８００kgf/cm² であっても９５％の牡蠣が開殻し、その全てが脱殻まで至っている。また、水温が４０℃の場合には耐圧容器２内の圧力が７００kgf/cm² であっても９７％の牡蠣が開殻し、その全てが脱殻まで至っている。更に、水温が５０℃の場合には耐圧容器２内の圧力が６００kgf/cm² であっても９７％の牡蠣が開殻し、その殆どが脱殻まで至っている。

【００３４】
本実験の結果から、水温を３０℃以上に設定すれば、水温を２０℃以下に設定した場合に比べて、耐圧容器２内の圧力を１／４程度またはそれ以下に設定しても殆どの牡蠣を開殻させ、また脱殻まで至らせることができることが判る。但し、水温を５０℃とした場合、牡蠣の身に含まれているタンパク質が不可逆的な熱変性を生じる可能性があるため、この温度域で開殻を行わせることはあまり好ましくない。実際には、水温が３０℃～４５℃の範囲で開殻率が９５％以上となる圧力域を使用することが好ましい。例えば、水温が３０℃の場合には耐圧容器２内の圧力を８００kgf/cm² に設定し、また、水温が４０℃の場合には耐圧容器２内の圧力を７００kgf/cm² に設定し、更に、水温が４５℃の場合には耐圧容器２内の圧力を６５０kgf/cm² 程度に設定するのである。これ

[0033]
In particular, when water temperature is 30 degree C, even when the pressure in a pressure container 2 is 800 kgf/cm2s, 95% of an oyster carries out an open shell. The all have resulted to taking the meat out of the shell.

Moreover, when water temperature is 40 degree C, even when the pressure in a pressure container 2 is 700 kgf/cm2s, 97% of an oyster carries out an open shell, and the all have resulted to taking the meat out of the shell.

Furthermore, when water temperature is 50 degree C, even when the pressure in a pressure container 2 is 600 kgf/cm2s, 97% of an oyster carries out an open shell, and the most has resulted to taking the meat out of the shell.

[0034]
From the result of this experiment, if water temperature is set as 30 degree C or more, almost all the oysters are opened even when it sets up the pressure in a pressure container 2 at 1/4 or less than it, compared with the case where water temperature is set as 20 degree C or less.

Moreover that it can be made to result to taking the meat out of the shell understands.

However, when water temperature is made into 50 degree C, protein contained in the body of an oyster may produce an irreversible thermal denaturation. Therefore, it is not so preferable to make an open shell perform by this temperature range.

It is preferable that the rate of an open shell uses in fact the pressure region used as 95 % or more in the range whose water temperature is 30 degree C - 45 degree C.

For example, when water temperature is 30 degree C, the pressure in a pressure container 2 is set as 800 kgf/cm2s.

Moreover, when water temperature is 40 degree C, the pressure in a pressure container 2 is set as 700 kgf/cm2s.

Furthermore, when water temperature is 45 degree C, the pressure in a pressure container 2 is set as about 650 kgf/cm2s.

らの場合には、殆どの牡蠣が開殻だけでなく脱殻まで至るので、耐圧容器２から取り出した牡蠣に対して脱殻作業を行う必要は殆どない。また、殆どの牡蠣を脱殻まで至らせる必要が無く、開殻のみを行わせればよい場合には、もう少し低い温度及び低い圧力を牡蠣に作用させれば済むのである。尚、この開殻のみを行わせた場合であっても、既に、牡蠣の閉殻筋と外殻との接合部分は外れ易い状態になっているので、脱殻作業は極めて容易に行える。

Since almost all oysters result not only to an open shell but to taking the meat out of the shell in these cases, there is almost no necessity of performing the taking the meat out of the shell operation with respect to the oyster taken out from the pressure container 2.

Moreover, there is no necessity of making almost all oysters resulting to taking the meat out of the shell. If a little lower temperature and a low pressure are made act on an oyster when what is sufficient is just to make only an open shell perform, it ends.

In addition, already, even if it is the case where only this open shell is made to perform, since it is the state where it is easy to separate, the junctional part of the closed shell muscle of an oyster and an outer covering can perform taking the meat out of the shell operation extremely easily.

【００３５】
（第２実験の結果）第２実験の結果を以下の表２に示す。

[0035]
(Result of the 2nd experiment) The result of the 2nd experiment is shown in the following table 2.

【００３６】

[0036]

【表２】

[Table 2]

	圧力条件（kgf/cm²）	温度条件（℃）	作用時間（min）	効果
条件１	大気圧	43	6	開殻せず
条件２	500	40	2	開殻
条件３	700	44	6	開殻・片側脱殻
条件４	700	44	7	開殻・片側脱殻
条件５	750	44	6	開殻・脱殻
条件６	800	43	3	開殻・片側脱殻５０％の貝は脱殻
条件７	800	43	4	開殻・脱殻
条件８	800	43	5	開殻・脱殻
条件９	800	43	6	開殻・脱殻
条件１０	1000	40	4	開殻・脱殻

【００３７】
実験条件１の結果が示すように、耐圧容器２内の温度を４３℃とし、作用時間を６分に設定しても、耐圧容器２内の圧力が大気圧である場合には牡蠣を開殻させることはできない。それに対し、実験条件２の結果が示すように、耐圧容器２内の温度を実験条件１よりも低い４０℃とし、作用時間を実験条件１よりも短い２分に設定した場合であっても、耐圧容器２内の圧力を５００kgf/cm^{2}に設定すれば牡蠣は開殻する。この両条件の実験結果を比較することにより、所定の圧力を作用させれば、温度が低く且つ作用時間が短くても開殻を行うことができることが確認できる。

【００３８】
また、条件１～条件１０の各実験結果を比較することにより、温度を高く設定するほど、また、圧力を高く設定するほど、更には作用時間を長く設定するほど、開殻に留まらず脱殻まで至らせることができることが判る。特に、実験条件３及び４と実験条件６～８とを比較した場合、実験条件３及び４では、部分的な脱殻しか行えなかったのに対し、実験条件６～８では、実験条件３及び４に比べて温度が低く作用時間を短いにもかかわらず、圧力を僅かに高く設定することで脱殻まで至らせることができることが確認できる。

[0037]
Temperature in a pressure container 2 is made into 43 degree C so that the result of the experiment conditions 1 may show.

Even when it sets up the effect duration in 6 minutes, when the pressure in a pressure container 2 is atmospheric pressure, the open shell of the oyster cannot be carried out.

To it, temperature in a pressure container 2 is made into 40 degree C lower than the experiment conditions 1 so that the result of the experiment conditions 2 may show.

If the pressure in a pressure container 2 is set as 500 kgf/cm2s even when it is the case where the effect duration is set up in 2 minutes when it is shorter than the experiment conditions 1, the open shell of the oyster will be carried out.

If a predetermined pressure is made act by comparing the experimental result of this both condition, even if temperature is low and the effect duration is short, it can confirm that an open shell can be performed.

[0038]
Moreover, that it cannot stop at an open shell but it can be made to result to taking the meat out of the shell understands so that the effect duration is set up for a long time further, so that temperature is highly set up by comparing each experimental result of the condition 1-conditions 10, and so that a pressure is set up highly.

In particular, when comparing the experiment conditions 3 and 4 and the experiment conditions 6-8, only partial taking the meat out of the shell was able to be performed on the experiment conditions 3 and 4. On the experiment conditions 6-8, temperature is low comparing with the experiment conditions 3 and 4. It can confirm that the effect duration can nevertheless be made to result to taking the meat out of the shell with the short thing which a pressure is set up highly slightly.

【００３９】
本実験の結果から、耐圧容器２内の温度及び圧力だけでなく作用時間をも考慮することにより開殻動作を効率的に行うことができることが判る。例えば、実験条件６～８を比較することにより、耐圧容器２内の圧力を８００kgf/cm² とし、温度を４３℃とする場合には、作用時間を４分に設定することで、必要最小限の作用時間で牡蠣を脱殻まで至らせることができることが判る。このように、温度及び圧力を適切に設定しておけば、作用時間が短くても開殻及び脱殻を行わせることができ、単位時間当たりに処理できる貝の個数を増大できるのである。

[0039]
The result of this experiment shows that an open shell operation can be efficiently performed by considering not only the temperature and the pressure in a pressure container 2 but the effect duration.

For example, make the pressure in a pressure container 2 be 800 kgf/cm2s by comparing the experiment conditions 6-8.

In making temperature into 43 degree C, that an oyster can be made to result to taking the meat out of the shell by the effect duration of necessary minimum understands by setting up the effect duration in 4 minutes.

Thus, even if the effect duration is short, an open shell and taking the meat out of the shell can be made to perform, if temperature and the pressure are set up adequately.

The number of the shellfish which can be treated to per unit duration can be increased.

【００４０】
（第３実験の結果）第３実験の結果を以下の表３に示す。

[0040]
(Result of the 3rd experiment) The result of the 3rd experiment is shown in the following table 3.

【００４１】

[0041]

【表３】

[Table 3]

圧力 (kgf/cm²) ＼ 水温 (℃)	30	43	45
500	20	20	40
600	20	—	—
700	60	70	80
900	70	100	100
1000	—	100	100

【００４２】
この表３に示すように、水温が３０℃の場合には耐圧容器２内の圧力が９００kgf/cm² であっても７０％の帆立貝が開殻している。また、水温が４３℃の場合には耐圧容器２内の圧力が７００kgf/cm² であっても７０％の帆立貝が開殻し、同様に、水温が４５℃の場合には耐圧容器２内の圧力が７００kgf/cm² であっても８０％の帆立貝が開殻している。

[0042]
Even when the pressure in a pressure container 2 is 900 kgf/cm2s when water temperature is 30 degree C as shown in this table 3, 70% of the scallop is carrying out the open shell.

Moreover, when water temperature is 43 degree C, even when the pressure in a pressure container 2 is 700 kgf/cm2s, 70% of a scallop carries out an open shell. Similarly, when water temperature is 45 degree C, even when the pressure in a pressure container 2 is 700 kgf/cm2s, 80% of the scallop is carrying out the open shell.

【００４３】
本実験の結果から、牡蠣に限らず帆立貝においても水温を３０℃以上に設定すれば、耐圧容器２内の圧力を１０００kgf/cm² 未満に設定しても殆どを開殻させることができることが判る。

[0043]
From the result of this experiment, if it does not restrict to an oyster but water temperature is set as 30 degree C or more also in a scallop, even when it sets the pressure in a pressure container 2 as less than 1000 kgf/cm2s, it turns out that the open shell of most can be carried out.

【００４４】
（第４実験の結果）第４実験の結果を以下の表４に示す。

[0044]
(Result of the 4th experiment) The result of the 4th experiment is shown in the following table 4.

【００４５】

[0045]

【表４】

[Table 4]

圧力 (kgf/cm²) ＼ 水温 (℃)	30	43	45
500	0	20	40
600	20	—	—
700	50	90	90
900	70	100	100
1000	—	100	100

【００４６】
この表４に示すように、水温が３０℃の場合には耐圧容器２内の圧力が９００kgf/cm² であっても７０％の浅蜊が開殻している。また、水温が４３℃の場合及び４５℃の場合には耐圧容器２内の圧力が７００kgf/cm² であっても９０％の浅蜊が開殻している。

[0046]
Even when the pressure in a pressure container 2 is 900 kgf/cm2s when water temperature is 30 degree C as shown in this table 4, 70% of the short-neck clam is carrying out the open shell.

Moreover, when water temperature is 43 degree C, and when it is 45 degree C, even when the pressure in a pressure container 2 is 700 kgf/cm2s, 90% of the short-neck clam is carrying out the open shell.

【００４７】
本実験の結果から、上述した牡蠣及び帆立貝に限らず浅蜊においても水温を３０℃以上に設定すれば、耐圧容器２内の圧力を１０００kgf/cm² 未満に設定しても殆どを開殻させることができることが判る。

[0047]
From the result of this experiment, if it does not restrict to the oyster and the scallop which were mentioned the above but water temperature is set as 30 degree C or more also in a short-neck clam, even when it sets the pressure in a pressure container 2 as less than 1000 kgf/cm2s, it turns out that the open shell of most can be carried out.

【００４８】
これら第３及び第４の実験結果から、帆立貝及び浅蜊に関しては、水温を４３℃に設定し、耐圧容器２内の圧力を７００kgf/cm² ～９００kgf/cm² 程度に設定すれば、その殆どを開殻させることができることが判る。

[0048]
From these the 3rd and 4th experimental results, water temperature is set as 43 degree C about a scallop and a short-neck clam.

If the pressure in a pressure container 2 is set as about 700 kgf/cm2-900 kgf/cm2, it turns out that the open shell of the most can be carried out.

【００４９】
－他の実施形態－
上述した実施形態では、二枚貝として牡蠣、帆立貝、浅蜊を対象とし、これらの貝を開殻させる場合を例に掲げて説明した。本発明は、蛤等のその他の二枚貝にも適用することが可能である。

[0049]
- The other Embodiment -

In the embodiment mentioned the above, an oyster, a scallop, and a short-neck clam are made objective as a bivalve.

The case where the open shell of these shellfishes was carried out was hung up and explained to the example.

This invention can be applied also to the bivalve of others, such as ﾈｺ.

【００５０】
また、本発明の発明者らは、二枚貝の開殻方法として、貝を収容した容器内の水に苦汁を混入し、そのマグネシウムイオンの影響により閉殻筋を弛緩させて開殻させることを既に見出している。従って、このマグネシウムイオンによる閉殻筋の弛緩効果を利用すべく、上記耐圧容器２内に苦汁を混入しておけば、更に効率良く開殻させることができると推測される。

[0050]
Moreover, the inventors of this invention mix bitter_juice in water in the container which received the shellfish, as a method of opening bivalves.

It has already found out that a closed shell muscle is made to relax under the influence of the magnesium ion, and an open shell is carried out.

Therefore, that the relaxation effect of the closed shell muscle by this magnesium ion should be utilized, if bitter_juice is mixed in the above pressure container 2, it will be assumed that an open shell can be carried out more efficiently.

【００５１】
更に、上述した実験では、耐圧容器２内を加熱した後に加圧していた。これに限らず、耐圧容器２内を加圧した後に加熱を行ったり、この加熱と加圧とを同時に行ったりすることで、更に効率良く開殻させることができる可能性がある。

[0051]
Furthermore, in experiment mentioned the above, it was pressing, after heating the inside of a pressure container 2.

It heats, after not restricting to this but pressing the inside of a pressure container 2.

Moreover, it is performing simultaneously and the open shell of this heating and pressure application may be able to be carried out more efficiently.

【００５２】

[0052]

【発明の効果】
以上のように、本発明によれば、以下のような効果が発揮される。

[EFFECT OF THE INVENTION]
As mentioned above, according to this invention, the following effects are demonstrated.

【００５３】
請求項１記載の発明では、殻付の生の二枚貝に対して熱及び圧力の両方を作用させ、その相乗効果により開殻させるようにしている。この作用させる熱としては、貝の身のタンパク質に熱変性が生じない温度域またはこのタンパク質の熱変性が可逆的なものである温度域となるよう

[0053]
In invention of Claim 1, both heat with respect to raw bivalves having shells and pressure are made act.

It is made to carry out an open shell according to the synergistic effect.

It is made to become the temperature range which a thermal denaturation does not produce in the shell meat protein, or the temperature range whose thermal denaturation of this protein is reversible, as this heat to make act.

にしている。また、作用させる圧力としては、上記温度で貝の閉殻筋と外殻との接合部分を外すことができる必要最低限に設定すればよい。従来は、数千kgf/cm^{2}といった非常に高い圧力を貝に作用させて開殻させていた。このため、高い耐圧性を有する圧力容器が必要であり、圧力容器の製造コストが高かった。また、非常に高い圧力の環境下に貝を晒すため、貝の身のタンパク質が圧力の影響を受けて変性し、剥き身の食感や風味が損なわれてしまう可能性があった。本発明によれば、貝を剥き身の食感や風味が損なわれない程度まで加熱し、この貝に圧力を作用させて開殻させている。このため、比較的低い圧力であっても開殻させることができる。従って、圧力容器に要求される耐圧性も比較的低くでき、この圧力容器の製造コストを低減できる。その結果、二枚貝の開殻方法を実用化する際の装置の実用性の向上を図ることができる。また、圧力の悪影響によるタンパク質の変性が殆ど無いので、剥き身の食感や風味を良好に保つことができる。

Moreover, what is sufficient is just to set as the necessary minimum which can remove the junctional part of the closed shell muscle of shellfish, and an outer covering at above temperature, as a pressure to make act.

Conventionally, the open shell of a very high pressure said several thousand kgf/cm2 was made act and carried out to the shellfish.

For this reason, the pressure vessel which has a high pressure resistance is necessary.

The manufacturing cost of a pressure vessel was high.

Moreover, in order to expose shellfish to the environment of a very high pressure, the shell meat protein denatures in response to the influence of a pressure.

The food feeling and the taste of the shucked shell meat may be impaired.

According to this invention, shellfish is heated to the level by which the food feeling or the taste of the shucked shell meat are not impaired.

The open shell of the pressure is made act and carried out to this shellfish.

For this reason, an open shell can be carried out even if it is a comparatively low pressure.

Therefore, the pressure resistance required of a pressure vessel can also be made comparatively low.

The manufacturing cost of this pressure vessel can be reduced.

The improvement in the practicability of the apparatus at the time of as a result utilising the method of opening bivalves can be attempted.

Moreover, since there is almost no denaturation of protein by the bad influence of a pressure, the food feeling and the taste of the shucked shell meat can be maintained satisfactorily.

【００５４】
更に、剥き身のタンパク質に不可逆的な熱変性が生じないようにしているので、これによっても、剥き身の食感や風味を良好に保つことができる。

[0054]
Furthermore, since the irreversible thermal denaturation is made not to be generated in protein of the shucked shell meat, the food feeling and the taste of the shucked shell meat can be satisfactorily maintained also by this.

【００５５】
つまり、本発明によれば、作業者による手作業を不要にしながら、剥き身の食感や風味を損うことなく、しかも実用性の高い開殻方法を得ることができるのである。

[0055]
In other words, according to this invention, the method of opening of the high practicability can be obtained, without impairing the food feeling and the taste of the shucked shell meat, making the manual work by the operator unnecessary.

【００５６】
請求項２記載の発明は、二枚貝を開殻する場合の温度域及び圧力域を具体化している。このため、本方法を実施する場合の実用性の向上を図ることができる。

[0056]
Invention of Claim 2 has materialized the temperature range in the case of carrying out the open shell of the bivalve, and the pressure region.

For this reason, the improvement in the practicability in the case of implementing this method can be attempted.

【図面の簡単な説明】

[BRIEF EXPLANATION OF DRAWINGS]

【図１】
実施形態に係る実験装置の模式図である。

[FIGURE 1]
It is the model figure of test equipment based on an embodiment.

【図２】
第１の実験の結果をグラフ化した図である。

[FIGURE 2]
It is the figure which graph-ized the result of first experiment.

【符号の説明】
２　　耐圧容器

[EXPLANATION OF DRAWING]
2　　Pressure Container

【図１】

[FIGURE 1]

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TABLE I

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5 MINUTES UNDER PRESSURE

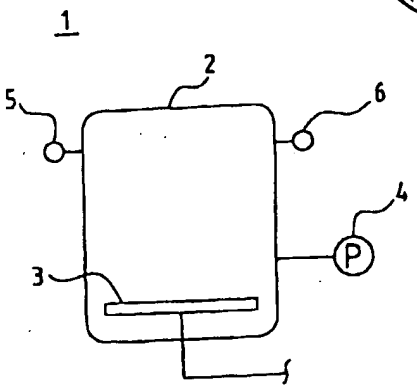
	50°F			68°F			86°F			104°F			122°F		
	水温10℃			水温20℃			水温30℃			水温40℃			水温50℃		
圧力 (kgf/cm²)	開殻率 (%)	開殻のみ (%)	脱殻 (%)	開殻率 (%)	開殻のみ (%)	脱殻 (%)	開殻率 (%)	開殻のみ (%)	脱殻 (%)	開殻率 (%)	開殻のみ (%)	脱殻 (%)	開殻率 (%)	開殻のみ (%)	脱殻 (%)
500	—			—			—			0	0	0	88	5	95
600	—			—			0	0	0	82	14	86	97	1	99
700	—			—			66	91	9	97	—	100	—		
750	—			—			80	5	95	—			—		
800	—			—			95	—	100	—			—		
900	—			0	0	0	—			—			—		
1000	0	0	0	19	100	—	—			—			—		
1500	15	100	—	30	87	13	—			—			—		
2000	22	91	9	68	12	88	—			—			—		
2500	78	10	90	84	8	92	—			—			—		
3000	85	—	100	92	—	100	—			—			—		
3500	93	—	100	97	—	100	—			—			—		
4000	98	—	100	95	—	100	—			—			—		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C

A PERCENT ONLY OPENED (CAPPED)

B CAPPED BUT MUSCLE STUCK TO SHELL.

C. MUSCLE RELEASED FROM SHELL

EXHIBIT 3



【図２】

[FIGURE 2]